

Lemonade Mix: Teaching Notes

Francine Cabral Roy

GRADE RANGE: 5–9

MATHEMATICAL TOPICS: ratio, proportion, linear functions, tables, graphs

Discussion of the Mathematics

The important ideas are the connections among various aspects of ratio and proportion; for example, connecting the ratios embedded in the table with the slopes of the two line graphs, connecting the ratios of mix to water for different numbers of pitchers to make proportions; connecting slope to visual characteristics (e.g., position and steepness) of the graphs.

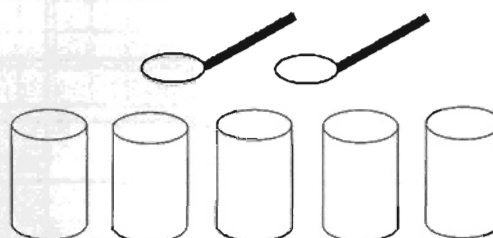
Implementation

This activity builds an understanding of proportional reasoning through the use of a physical context rather than mathematical procedures. Once understanding is established, more sophisticated procedures can be discussed. For example, after students solve problem 2, the teacher could help them compare additive strategies with multiplicative strategies. A multiplicative strategy serves as a quantitative underpinning for slope and can help students create closed algebraic representations of linear functions.

Students' Typical Responses

Students have the most difficulty with missing-value proportion problems (e.g., problem 4) that cannot be solved by equivalent fractions. There are several strategies that you might suggest to help students think about these problems: estimating, drawing a diagram, and guess and check. For example, students can draw a diagram representing 2 tablespoons (tbsp.) of mix and 5 cups of water and

then estimate the solution (e.g., Is it less than 1? Less than $1/2$?). Using the diagram, they can divide the 2 tbsp. of mix into equal portions and fit them into the 5 cups of water.



After guessing and checking, most students can divide each tbsp. into fifths and then distribute each fifth into one of the cups. Each cup of water (i.e., the unit rate) needs two fifths of a tbsp. of mix.

Additional Information

The activity relies heavily on problem solving, so you may need to encourage students to persevere. If students are having difficulty, focus their attention on the physical context and encourage them to estimate. In these problems, students' thinking and reasoning are valued over right or wrong answers.

CREDIT

Lappan, Glenda, James T. Fey, William M. Fitzgerald, Susan N. Friel, and Elizabeth Difanis Phillips. *Comparing and Scaling: Ratio, Proportion, and Percent*. Menlo Park, Calif.: Dale Seymour Publications, 1998.

Lemonade Mix

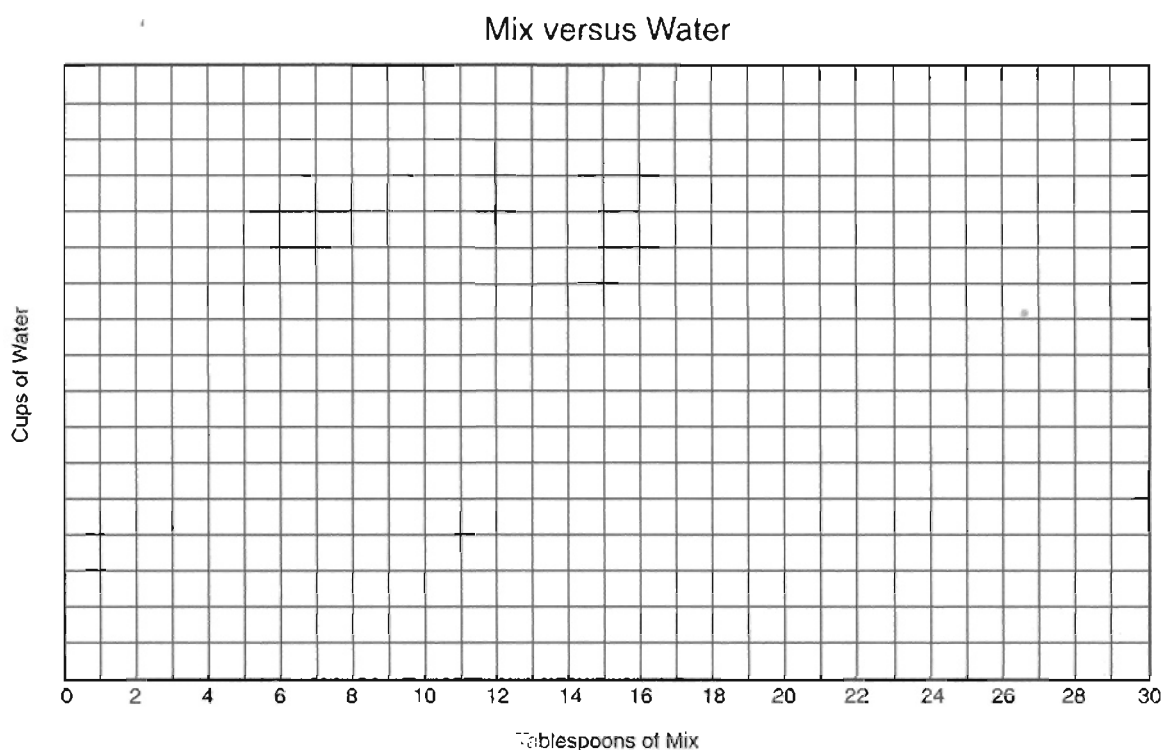
Below are two recipes for making lemonade. Recipe 1 calls for 2 tablespoons (tbsp.) of mix for each 5 cups of water. Recipe 2 calls for 4 tbsp. of mix for every 7 cups of water. Complete the table to determine the amount of mix and water for the given numbers of pitchers.

	RECIPE 1		RECIPE 2	
Pitchers	Lemonade Mix (tbsp.)	Water (Cups)	Lemonade Mix (tbsp.)	Water (Cups)
1	2	5	4	7
2				
3				
4				
5				
6				
7				
8				
9				
10				

- Which recipe tastes more “lemony”? Explain at least two ways the table can help you choose the more lemony recipe.
- For Recipe 1, how many tbsp. of mix would you need to make 100 cups of lemonade? For 1000 cups of lemonade? Explain how you got your answers.
- Suppose that you only had 1 tbsp. of mix. How many cups of lemonade could you make using Recipe 1? Using Recipe 2? Explain how you got your answers.
- Suppose you want to make only one cup of lemonade. How much mix would you need using Recipe 1?

Using Recipe 2? Explain how you got your answers.

On the grid below draw line graphs for the amounts of mix and water for Recipe 1 and Recipe 2.



5. How are the graphs similar? How are they different? Why is one graph “higher” than the other? Why is one graph “steeper” than the other?
6. As the amount of mix increases, do the graphs seem to be further apart or closer together? Explain why this is happening.
7. How can you use the comparison of the two graphs to determine which recipe is more lemony?